

# Astro News



**Special Edition**

Montage by Isabel Vandernoot, SMC Art Services



# ‘SMC Team’ vital to air and space integration

Lt. Gen. Eugene Tattini  
SMC Commander

Since taking command of SMC, I’ve tried to get out and talk to people to get a sense of the overall well being and esprit de corps of our organization. I’m proud to report the men and women of this great team continue to exhibit the type of can-do spirit that has made SMC the preeminent space acquisition organization in the U.S., if not the world. Your sense of purpose and commitment to excellence have been the stabilizing factors that have gotten us through some tough times the last couple of years.

In the wake of well-publicized space launch failures and several broad area reviews, you have managed to engineer success out of failure as we continue to forge the shape of military space for the 21st century.

I applaud each of you for your perseverance as we continue to accomplish our mission of providing unrivaled space, missile and information capabilities and systems to the joint warfighter and our nation.

At the same time, I recognize space systems acquisition is a complex and often mystifying endeavor not well understood by the general public. Even within SMC, I think we sometimes fail to realize the interrelated nature of our program offices’

individual goals. If we’re not careful, this could contribute to misunderstanding and detract from true team building. The SMC team must view what we do here as an integrated, interrelated pursuit of space systems necessary to achieve air and space integration. In essence, the men and women who make up SMC comprise the fundamental foundation for integrating air and space capabilities that will move our Air Force toward a seamless aerospace force. In other words, who we are, what we do and how we do it is as vitally important as the other key warfighting elements of our aerospace force.

During my recent commander’s calls, it became evident that I need to do more to communicate this important message to our SMC team. That gave me the idea to commission this special issue of the *Astro News* as a means of explaining what our program offices do in support of our overall mission.

This special issue is an effort to re-look at our team as an integrated, interdependent totality – an entity that strives in unison to be recognized as the center of technical excellence and the product center of choice for innovative, affordable, operationally effective space systems.

I highly recommend you spend some time reading the articles published here as a means of getting a better sense of how the rest of your “Team SMC” contributes to our overall success.

## Astro News deadlines

The Los Angeles AFB paper, the *Astro News*, is published every other week on Friday. The editorial office is located within the Space and Missile Systems Center Public Affairs Office in Building 105, Room 4049, in Area A. The telephone number is (310) 363-6428.

Deadline for article submissions is Thursday, noon, the week before the publication date. Articles should be sent via e-mail to the editor at **SMC.PA.Astronews@losangeles.af.mil** or sent on disk. The mailing address is:

SMC/PAI -- Astro News editor  
2420 Vela Way, Suite 1467  
El Segundo, Calif. 90245-4659

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Apr. 21 .....	Apr. 13
May 5 .....	Apr. 27
May 19 .....	May 11
June 2 .....	May 25
June 16 .....	June 8
June 30 .....	June 22
July 14 .....	July 6
July 28 .....	July 20

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The Action Line is your direct link to **Col. David E. Price**, 61st Air Base Group commander.

Its purpose is to make Los Angeles AFB a better place to work, live and play. Of course the fastest way to resolve any problem is to ask the person who can actually fix it.

Below is a list of people who can do just that:

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Base IG .....	Dorothy Brown	363-0802
Chaplain .....	Lt. Col. Gary Garvey	363-1956



Civil Engineering .....	Lt. Col. William Saunders	363-0287	Services .....	Gary Van Dusen	363-0430
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Medical .....	Lt. Col. Mark Wisniewski	363-5005			
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Security Forces .....	Maj. Larry Bartlett	363-0032			

Try your supervisor, first sergeant or commander. If you are not able to resolve a problem, call the Action Line. Your call will be recorded and if you leave your name and phone number, you will receive an answer.

## Astro News

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## SMC: The place for space

**Hap Parker**  
Public Affairs

“Military space . . . the buck starts here.”

That’s the kind of catchy phrase you’d like to see, adorned with space-related graphics, displayed on a billboard next to the El Segundo Boulevard exit ramp off Interstate 405.

But, there’s nothing there – nothing at all. There’s no hint that more than \$56 billion in space assets are managed from this high-tech, Southern California location at the corner of Aviation and El Segundo Boulevard in El Segundo.

Nestled on the extreme eastern side of the city of El Segundo, just three miles southwest of Los Angeles International Airport, is Los Angeles AFB, home of the Space and Missile Systems Center. Its vision – Forging the shape of military space for the 21st century.

From this campus-like setting of six buildings on 42 acres, employees research, develop and purchase military space systems. It is from this administrative hub that military space requirements and contract funding and management are funneled through individual system program offices.

“We are living in the most challenging times of military space. From medium to heavy lift rockets and boosters to satellites and orbiting spacecraft, it all starts here,” said Lt. Gen. Eugene Tattini, SMC commander. “We buy and deploy the military space systems that provide warfighting capabilities to our nation and allied forces.”

At any given time, one may find anywhere from 15 to 19 different defense space programs in the works. “We are the technical conscience of the military space acquisitions effort,” the general said in reference to the developmental planning, contract management and systems acquisitions work that supports the various program offices at SMC.

Together, these three offices form the focal point for most Department of Defense space acquisition activities. They complement the research, comprehensive technical development and acquisition and sustainment expertise to deliver unrivaled space, missile and information systems to the joint warfighter.

Without the activities performed in these offices, efforts would be at a standstill in areas such as communications, navigation, surveillance, missile warning, weather, space control, range safety and security for launches.

SMC has a \$5.5 billion annual operating budget to finance acquisition of military space systems. This includes an annual military and government civilian payroll of approximately \$203 million. The center employs 1,535 military members and 2,890 civilian employees, including contractor personnel and The Aerospace Corporation, a co-located, non-profit, federally-funded research and development center.

Los Angeles AFB also has 54 acres just north-west of the main campus with facilities to support SMC and military retirees. Here, you’ll find a clinic, commissary, base exchange and gas station. An additional 13 acres with one building, a softball field and a RV parking lot are located in Hawthorne, a couple of miles south of the main SMC complex.

# BAR signals procedural change

**Capt. Jodi Unsinger**  
Public Affairs

The conclusions of the White House-chartered and Department of Defense-conducted Broad Area Review or BAR, of Space Launch completed last fall has had a far-reaching impact on processes and programs at the Space and Missile Systems Center. The Air Force, tasked by the White House and Defense Department officials last year to assess the spacelift program in light of recent launch mishaps, completed the DoD Assessment of Space Launch Failures report in November.

The nature and timing of five mishaps, two Titan IV, one inertial upper stage and two Delta III launches in two years, prompted the review of failures and actions being taken to prevent future mishaps.

As part of the DoD assessment, the Air Force’s space launch BAR examined the entire launch process and forwarded recommended changes in practices, procedures and operations.

The report, based on Air Force accident investigation board findings, an Air Force-National Reconnaissance Office and independent industry reviews, concluded engineering and workmanship-related deficiencies led to the failures, totaling nearly \$3 billion in losses.

Retired Air Force General Larry Welch, who led the launch BAR steering group, briefed senior SMC officials on the results and recommendations here in January.

The DoD assessment made 19 recommendations in five key areas that apply to the fly-out of legacy launch systems and the transition to the evolved expendable launch vehicles:

- the government must ensure industry acts to correct causes of the recent failures and improve systems engineering and process discipline;
- clear accountability for mission success for remaining launches and transition to EELV must be defined;
- the government and industry partnership must be enhanced with increased management, engineering support and emphasis on mission success;
- a well-defined, coordinated and disseminated transition plan to EELVs should be completed.

“For SMC, this has translated into several key adjustments in how the Center conducts a launch campaign,” said William Maikisch, SMC’s executive director. “Numerous changes in Air Force Space Command and SMC roles and responsibilities were made in response to the BAR.”

SMC will assume the mission director’s role for launches and will retain responsibility for boosters and

SMC payloads through the flight readiness review at which point Air Force Space Command will take over executing the launch count, said Maikisch.

“The ‘go’ or ‘no go’ recommendation to the launch decision authority wing commander to launch is made at the mission director’s discretion, so this is important,” said Maikisch. “SMC is a logical choice for mission director since launches are inherently engineering-oriented processes.”

“Engineering responsibility for flight worthiness remains with SMC all the way through the launch process to satellite deployment on orbit, even though the assets become Air Force Space Command property,” he said.

The BAR reported that it was unclear to contractors, Air Force Space Command and SMC who had what specific responsibilities for launch base activities.

“One of the surest paths to failure is to not understand who has responsibility for a given activity during launch processing,” said Maikisch, who, along with Maj. Gen. Robert Hinson, 14th Air Force commander, were tasked by the Air Force vice chief of staff to resolve launch base roles and responsibilities issues.

Historically, AFSPC assumed responsibility of the assets once they reached Cape Canaveral Air Station or Vandenberg AFB where they would be launched. Maikisch said there’s now a clearly defined process that leverages the skills of both commands.

Manpower was another critical issue addressed by the BAR, which reported a deficiency of engineering oversight of contractors in the launch vehicle programs. “As a function of our manpower review, SMC is asking for additional engineering positions for Los Angeles and our detachments at Cape Canaveral and Vandenberg,” said Maikisch.

Changes for the better are not without challenges. “We need to ensure assets are handed off smoothly from SMC to Air Force Space Command, and that a sufficient flow of information back to the mission director, SMC, exists so we can respond in a timely manner if a mission needs to be reevaluated and possibly scrubbed,” he said. “Also, if we acquire additional manpower, we need to ensure it’s balanced out among the system program offices to ensure they’re being utilized in the most effective manner.”

Maikisch pointed out that The Aerospace Corporation’s contributions to SMC’s mission accomplishment have become even more critical. “The shortage of military engineers makes Aerospace’s knowledge base more important than ever to the Center’s future successes,” he said.

## SMC/TL, new 2-letter, stands up May 1

A Department of Defense research project to improve national missile defense will begin reporting directly to the Space and Missile Systems Center commander here May 1.

The change reflects the Air Force’s increased priority on the space-based laser integrated flight experiment, a subordinate project of SMC’s advanced systems directorate, and the maturation of space-based laser technologies.

“Missile defense is a national priority,” said Lt. Gen. Eugene Tattini, SMC commander. “The space-based laser integrated flight experiment is important to the future of national security space missions.”

“This project’s success so far is a result of the outstanding job SMC and its advanced systems directorate

have done in executing military space programs and nurturing advanced development efforts into their own programs,” said the general.

Colonel William “Neal” McCasland is the project’s first director. He comes from SMC’s NAVSTAR Global Positioning System joint program office where he was the chief engineer. The office will be designated SMC/TL.

The SBL IFX is a jointly-funded Air Force and Ballistic Missile Defense Organization research effort executed by SMC to demonstrate the feasibility of the SBL concept and its technologies.

The experiment will conclude with a ballistic missile defense demonstration in space in compliance with the Antiballistic Missile Treaty. *See related story on Page 16 (Information courtesy of SMC Public Affairs.)*

# Planning Directorate spurs quest for battlefield advantage

**Capt. Jodi Unsinger**  
Public Affairs

Space and Missile System Center's developmental planning directorate will soon present a recommendation to the SMC commander on a technology that could give the U.S. military a distinct battlefield advantage over its enemies.

The directorate has been analyzing the concept of hyperspectral imaging for its capabilities and utilities in Air Force space systems, identifying technology requirements, developing its roadmap and integrating other government agencies' HSI efforts.

Developmental planning, along with SMC's advanced systems directorate, The Aerospace Corporation and Air Force Research Laboratory, has been heavily involved with several HSI-related projects, which has given SMC a stronghold in establishing itself as a possible space-based HSI center of excellence.

"We're the most capable entity for implementing space-based HSI because we're doing the roadmap, utility analysis and architectural studies," said Capt. Joe Kays of the developmental planning directorate.

The directorate has assisted Air Force Space Command and Air Combat Command

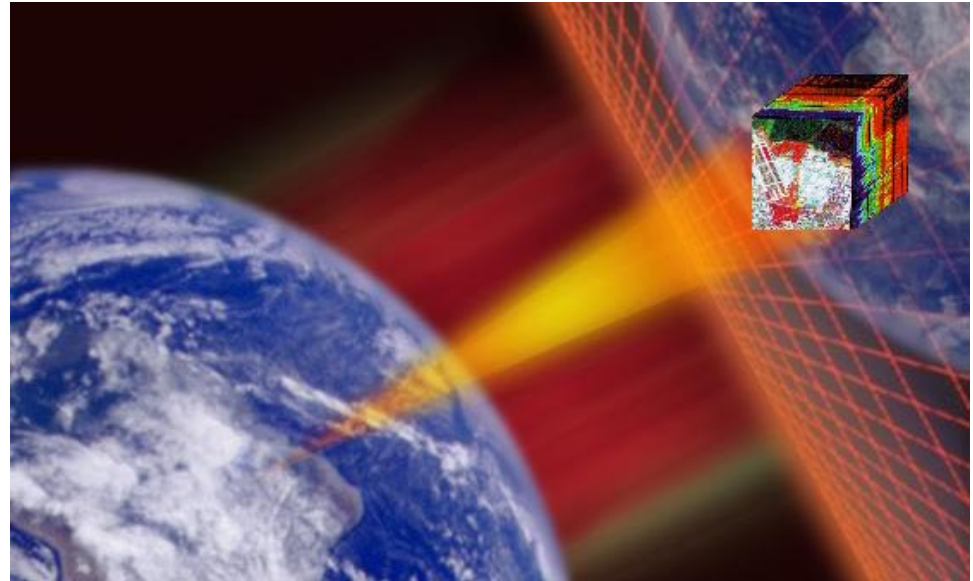
with developing a roadmap, which will provide decisionmakers with a proposed path for developing and deploying operational space-based HSI systems. It also identifies implementation options, key decision points, associated technologies and assigning activities to appropriate agencies and events to a time frame for fielding HSI technologies.

In last year's Joint Expeditionary Force Experiment, the directorate supported a HSI experiment and display. However, it stirred up enough excitement to earn a part in this year's experiment and \$765,000 for support. This year, the HSI architecture will consist of four airborne and three satellite platforms.

These initiatives are very typical of what the developmental planning directorate does on an everyday basis. "The programs we're working on now are the programs of the future," said Col. Robert Cox, director of developmental planning.

Hyperspectral imaging collects data and forms images by "seeing" energy emitted by objects on the ground. Objects form a unique spectral "fingerprint," allowing them to be catalogued into a "library" of spectral images.

"This will bring an extraordinary capability to U.S. military planners and



Courtesy illustration

**Artist's conception of a space-based hyperspectral image, indicated by the cube, is made up of both spatial and spectral dimensions.**

warfighters," said Cox. "HSI is one of the new phenomena that will provide the Air Force with new orbital capabilities."

Other "phenomena" the directorate is involved with, said Cox, includes the concept design, development and military utility analyses of the Global Multimission Service Platform, an integrated system of navigation, timing and satellite communications that could be significant in achieving objectives of DoD's Joint Vision 2010, and the Space

Mobility Vehicle, a lightweight, reusable multimission upper-stage vehicle, which could be used for on-orbit servicing of space vehicles and reconnaissance.

For the developmental planning directorate, which is one the SMC's oldest two-letter organizations, its mission as a modeling and simulation and concept design center for future Air Force Space systems continues. "The planning we do now is the planning of the future," said Cox.



# SBIRS: 'System of systems' stands guard in space

Ronea Alger  
Public Affairs

Each day more than 400 people assigned to the Space Based Infrared System program office carry out duties to ensure requirements for the nation's next-generation missile early warning system stay fulfilled to meet the warfighter's needs.

"We manage a system of systems to provide this capability," said Col. Daniel Burkett II, SBIRS program director. "We research, develop and acquire these systems to keep America safe from missile threats. We work closely with our industry partners and manage each contract that provides these important capabilities.

"Our Defense Support Program has been deployed for nearly three decades and has done a marvelous job for us. It has allowed us the surveillance flexibility to support U.S. warfighters, allied forces and various intelligence communities."

"However, future plans and initiatives call for updates involving infrared platforms that will improve our ability to safeguard the nation from missile attack. The program is called SBIRS and has a jointly defined infrared mission capability to provide surveillance from space in four mission areas – improved missile warning, missile defense, battlespace characterization and technical intelligence," Burkett said. "It's like having eyes in the sky."

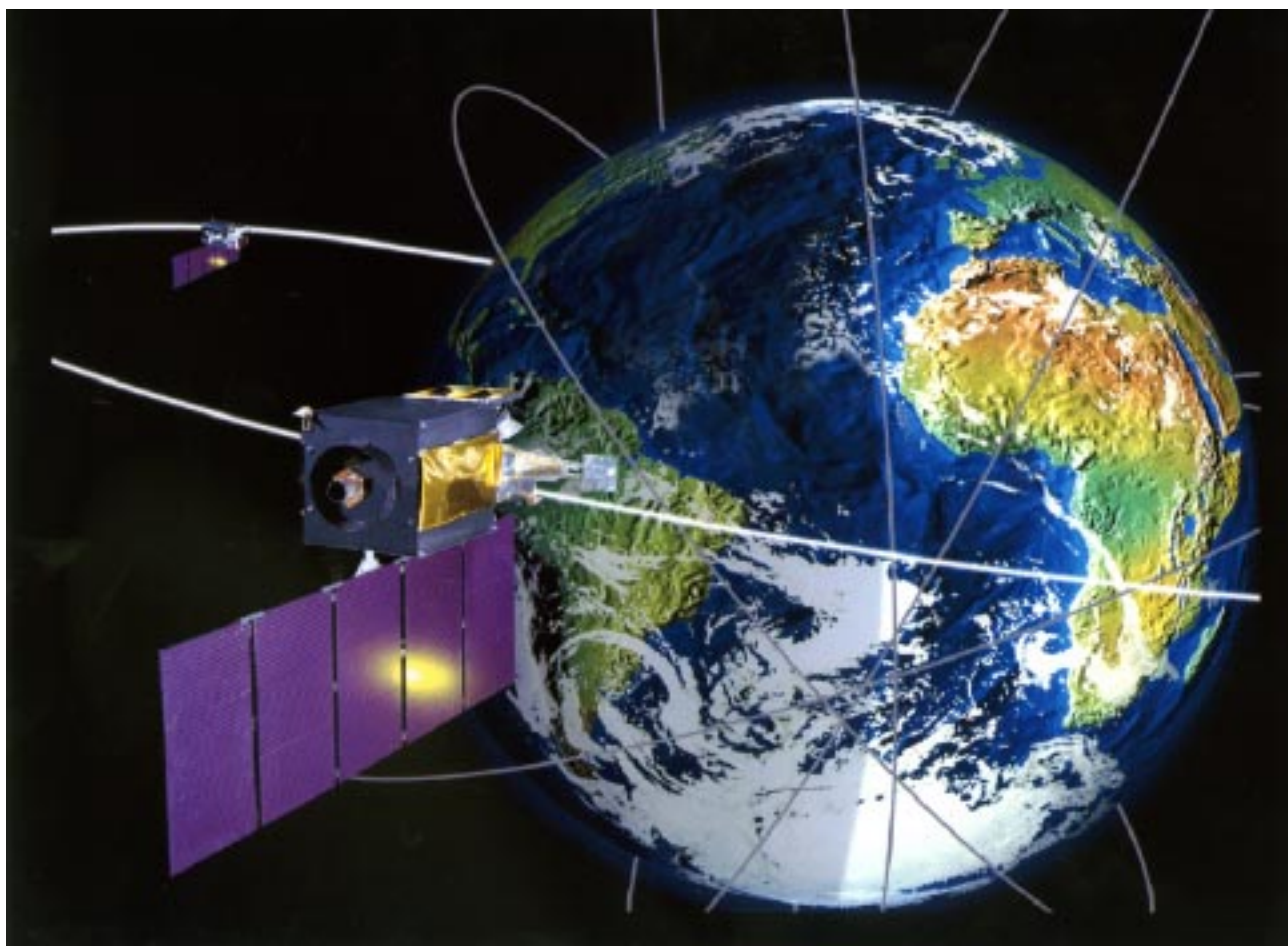
The purpose of the SBIRS is to develop a satellite system that provides increased performance over the existing Defense Support Program system. The system's primary mission is to provide initial warning of a ballistic missile attack on the U.S., its deployed forces or its allies. SBIRS will incorporate new technologies to enhance detection; provide direct reporting of intercontinental ballistic missiles and tactical ballistic missile launches; and provide critical mid-course tracking and discrimination data for national theater missile defenses.

"The systems will consist of sensors located in geosynchronous orbits, highly elliptical orbits and low earth orbits which will play a crucial role in the nation's space-based defenses well into the next century," said Burkett, whose total program is valued at more than \$27 billion. SBIRS is scheduled to be fully deployed by 2010.

## SBIRS High

The first of these new initiatives is SBIRS High, which will place a mix of four satellites in geosynchronous orbit at about 23,000 miles above the earth to assume the workload now performed by DSP and two satellites in a highly elliptical earth orbit. The system is designed to use satellites to gather missile warning and battlespace characterization data and then feed the information to a new consolidated ground processing station.

"SBIRS High is far more than a DSP replacement," said Burkett. "Significant improvements in sensitivity



Courtesy Illustration

**The above illustration is an artist's conception of a SBIRS High satellite in geosynchronous orbit at about 23,000 miles above the earth. The SBIRS High program will have four satellites in GEO earth orbit and two satellites in a highly elliptical earth orbit to assume the workload now performed by DSP.**

and pointing agility will provide a much more robust surveillance capability."

SBIRS High will provide more reliable, accurate and timely information on intercontinental ballistic missiles that would threaten the U.S. and shorter range theater ballistic missiles.

The satellite sensors will be more flexible and powerful than those on the current DSP satellites. For instance, while the sensors on DSP satellites scan the earth in a fixed pattern, SBIRS High adds a second sensor to each satellite that can be directed to "stare" at specific areas of interest on the earth.

The SBIRS High component is being developed to have two payloads in a highly elliptical orbit with its first delivery in 2002. The first of four geosynchronous satellites is planned for launch by 2004. The full system will be fully deployed by 2008.

The first incremental delivery of SBIRS High – consolidating multiple ground stations now located around the world to a single station in the U.S. – also will consolidate processing of strategic and theater missile detections. The consolidated ground station is scheduled to begin its initial operational test this year with an initial operational capability in mid-2001.

## SBIRS Low

To complement SBIRS High will be the SBIRS Low Component which will have 24 satellites in a low earth orbit about 1,000 miles above the earth scheduled to launch in 2006.

"SBIRS Low provides the capability to perform mid-course tracking of ballistic missile re-entry vehicles to support improved missile warning and missile defense," said Burkett. "The addition of the component also enhances SBIRS' capabilities in all other mission areas."

SBIRS Low is a passive, space-based, sensor surveillance system consisting of four segments. SBIRS Low will interact with numerous existing and future surveillance, warning, control networks, command and control centers and other elements.

SBIRS Low will have the ability to detect a missile in its boost phase and track it in mid-course when missiles are difficult to track because they no longer have a brightly burning rocket plume.

This component uses a network that includes low-earth orbit satellites that sits 1,000 miles above the earth.

SBIRS Low will track enemy missiles during the mid-course of their flight, providing enhanced tracking data and discrimination capability critical to missile defense.

## DSP provides early detection of nuclear explosions

The nation will continue using the Air Force Defense Support Program satellites to provide early detection and warning of missile launches and nuclear explosions to National Command Authorities and operational commands.

"The DSP satellites have been a key part of early warning systems since 1971," Col. Daniel Burkett II, SBIRS program direc-

tor. "Significant improvements in on-orbit sustainment and multi-source fusion of sensor assets have paved the way for many years of global missile warning and defense in the new millennium."

In their geosynchronous orbits, DSP satellites help protect the U.S. and its allies by detecting ballistic missile launches, space launches, nuclear detona-

tions and other infrared-observable events of interest. DSP satellites use infrared sensors to detect heat from missile and booster plumes against the earth's background.

Over the last 29 years, there have been 19 satellite launches with five major design changes. The DSP has five more satellites to be launched by 2003 for a total of 23. The next launch is scheduled aboard a Titan IV on May 8, from Cape Canaveral Air Force Station, Fla.



# DMSP: More than just a weather report

**Hap Parker**  
Public Affairs

When a Titan II space booster roared off the pad at Vandenberg Air Force Base, Calif., Dec. 12, 1999, it carried with it a next-generation weather satellite developed and purchased by Space and Missile Systems Center team members.

Launched into low earth, polar orbit at about 180 miles up, the Defense Meteorological Satellite Program was putting up its newest version designed primarily to provide weather and oceanographic data for global forecasting and military operational planning.

"The next-generation satellite we launched in December is a dream for our warfighters," said Col. Jeff Quirk, DMSP program director. "It accommodates larger sensor payloads than earlier generations and provides more advantages over former ones."

The new version features solid-state data recorders and a more powerful on-board computer to provide greater autonomy and five times the data receiving capability. The addition of a third battery increases spacecraft life from about four

to five years.

To the casual observer, knowledge of weather is usually restricted to an occasional television forecast that provides weather pictures to a civilian community.

One often sees how severe storms are monitored and how cloud formations indicate certain kinds of climatic conditions. Projected temperatures over certain periods of time normally accent a television meteorologist's forecast.

What the casual observer doesn't realize is there's more to weather than what meets the eye. Quite often, the underlying involvement of others far exceeds what one understands or expects from a television forecast.

"There are indeed commercial spinoffs from our weather satellite operations," Quirk said. "Our satellites have made it easier for meteorologists to bring accurate weather forecasts into the living room."

"DMSP also benefits the civilian community by routinely providing its weather pictures through the National Oceanic and Atmospheric Administration. This includes data for monitoring severe storms, as well as for ionospheric and marine research."

"But, when it comes to national concerns, there's more to it than that,"

said Quirk.

The military's need for weather satellites is important to battlefield commanders engaged in war. It can make the difference between success or failure.

"For more than three decades, our warfighters have relied on DMSP to help plan refueling of aircraft, rescue missions, and attacks around cloud cover, winds aloft, thunderstorms and ice," said Quirk.

DMSP provides data about the space environment that is critical in predicting the performance of high-frequency communications systems and over-the-horizon radar. It has the unique capability of providing soil-moisture measurements to help commanders avoid deployments through muddy terrain.

"Weather also affects airstrike target acquisition, performance of aircraft and weapons systems, as well as assessment of mission success. Accurate data is critical to choosing the right tools and timing needed to put our bombs on target," said Quirk.

DMSP feeds encrypted data to numerous weather stations on land and sea around the world. U.S. and allied forces in the field can transport small tactical terminals wherever they go, receiving data directly from the satellites.

Merger of the nation's military and civilian environmental satellite programs was directed by the President in 1994 and is expected to save taxpayers \$1.8 billion.

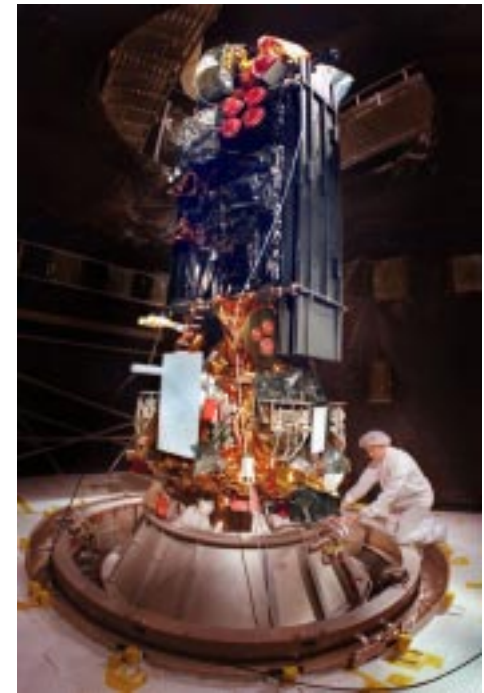


Photo by Russ Underwood

**A technician prepares the next-generation Air Force weather satellite for a December 1999 flight to orbit from Vandenberg AFB, Calif.**

# Test and Evaluation integral to launch success

**Ted Marrujo**  
SMC/TE

Since Jan. 1, four of the five SMC launch operations were programs carried out within its Test and Evaluation Directorate located at Kirtland AFB, N.M.

This pace won't slow down any time soon with two launches currently scheduled in April, one in May, two in June and three in July.

"My people are extremely busy, but they do their jobs superbly," said Col. James Ford, SMC/TE director. "The numerous projects we simultaneously work—and their successful completion—speaks to the quality of the work we do here."

SMC/TE has capabilities, resources, and command and control facilities to provide small launch vehicles and satellites, launch and on-orbit services, and developmental test capabilities to support the Department of Defense research and development community.

AFMC designated TE as the Single-Face-To-the-Customer or SFTC for space and missile development test and evaluation. "This is one of five such offices within the Air Force, each of which is the acknowledged 'test center of expertise' in their specialty—the others are EW, Air-

craft, Munitions and C4I," said Ford. "When you call the Space SFTC, our experts will either answer your test question or refer you to someone who can."

Made up of five major space and missile research, developmental, test and evaluation divisions and its support functions, TE has an aggregate of complex responsibilities. These include providing rockets, ballistic missiles and small space launch vehicles for Air Force and DoD customers; advancing space system technologies by providing spaceflight for experiments generated within the entire DoD space research and development community; providing research and development satellite telemetry; tracking and control of on-orbit operations; providing a cadre of test experts to support space and missile launch vehicle test planning, integration, launch and test control, analysis, and reporting; performing the Space Test SFTC function; and coordinating with headquarters AFMC on all space and missile test plans and policy requirements.

Providing a wide range of products and services to its customers, TE projects have varied from procuring one-of-a-kind satellites such as the Advanced Research and Global Observation Satellite to acquiring various launch systems such as sounding rockets, ballistic missiles, and the Taurus, Pe-

gasus, and Minotaur launch vehicles. TE also supplies ground systems including the Minuteman launch facilities at Vandenberg AFB and both fixed and mobile on-orbit TT&C capabilities.

Other services include mission planning, vehicle design and development, launch and flight control, post-flight analysis, evaluation and demonstration of new technologies and operational methods to provide safe, cost-effective mission operations for research, development, test and evaluation for space and missile programs.

Most recently, TE successfully launched the Department of Energy's Multispectral Thermal Imager satellite on a Taurus launch vehicle March 12. An up-coming mission is the Tri-Service Experiments Mission 5, carrying the Ballistic Missile Defense Organization's Space Technology Research Vehicle 2 and the Compact Environment Anomaly Sensor sponsored by AFRL.

In the launch vehicle mission area is the Orbital Sub-orbital Program. Part of this program provides suborbital vehicles to serve as targets and payload carriers for use in both Theater and National Missile Defense testing. In January, the first orbital launch using Minuteman III components successfully placed multiple payloads into orbit, one of which was built by USAF Academy students.

Meanwhile, the Space T&E Division is busy developing a commercial off-the-shelf, open, distributed architecture to provide TT&C on-orbit support for one-of-a-kind RDT&E satellites. This COBRA system is used in the Research, Development, Test and Evaluation Support Complex at Kirtland AFB and the Center for Research and Support located at Schriever AFB, Colo.

Currently, the RSC and CERES are flying 10 different spacecraft. These control centers can provide the full range of on-orbit satellite services. CERES is also being used to test and evaluate the next generation ground control software systems. TE owns and operates both of these satellite operation complexes using a mix of military, government civilian and contractor support.

Space T&E Division also owns and operates six deployable systems that are used to augment the Air Force Satellite Control Network. These systems can go to the factories where satellites are built to perform compatibility tests or deploy to places like South Africa and Australia to assist in vehicle tracking and satellite initializing operations.

While maintaining the launch pace for experimental rockets and satellites, TE recognizes the need to live up to its name, "Test and Evaluation Directorate," by working hard to become better testers. "My biggest priority in the near future is strengthening our space test capabilities," said Ford.



# NAVSTAR GPS: Beaming success for millions

**Peggy Hodge**  
Public Affairs

“The global positioning system allows users to calculate their location anywhere on earth. Today there are approximately four million GPS users around the world—military and civilian—and within 10 years, that figure will increase to 50 million,” said Col. Douglas L. Loverro, Director, GPS Joint Program Office.

NAVSTAR GPS is a space-based radio-positioning system featuring at least 24 orbiting satellites that provide navigation and timing information to military and civilian users worldwide. The system also consists of a worldwide satellite control network and GPS receiver units that pick up signals from the satellites and translate them into position, velocity and time information.

“GPS is powerful,” said Loverro. “And it is important. It is intricately interwoven into the fabric of our nation and is getting more so everyday. It is taken for granted in this interaction. You take on faith that GPS will be there. But it’s much more than an act of faith.

“The NAVSTAR GPS joint program office here at SMC is a multiservice, multinational organization conducting the development, acquisition and sustainment of GPS systems and resources,” said Loverro. It’s broken into three segments.

## Space

GPS uses the characteristics of radio transmissions for location determination. Unlike previous navigation systems using ground-based transmitters, satellite-based transmitters are used to cover the earth with higher accuracy than available from land-based systems. The satellites transmit timing, satellite location and satellite health information.

## User

The user requires a GPS receiver to accept the transmissions from the satellite. The GPS receiver contains a specialized computer that calculates the location based on the satellite signals. The user does not have to transmit anything to the satellite, and the satellite does not know the user is there. There is no limit to the number of users that can be using the system at any one time.

## Control

The satellites are controlled and monitored from ground stations. The control stations monitor the satellites for health and accuracy. Maintenance commands, orbital parameters and timing corrections are uploaded from the



Courtesy photo

**A technician works on a GPS Block II satellite in preparation for shipment to the launch facility.**

ground on a periodic basis.

## How It's Used

“For the military, GPS provides critical services including situational awareness and precision weapon guidance,” said Col. Allen Ballenger, User Equipment Division Chief. “This dual-use satellite has also spurred economic growth in many consumer sectors. It’s opened whole new ways of doing business.”

The Air Force uses GPS for bomb and missile guidance. Conventional air-launched cruise missiles launched from B-52s did go to war over Kosovo as part of Operation Allied Force last year. These missiles contained single-channel GPS receivers which were quickly integrated into the missile’s existing navigation system. At Kosovo, we showed the B-2 could drop bombs through the rain, clouds and in complete darkness with tremendous precision. We showed that our new satellite-guided weapons—joint direct attack munitions and joint stand off weapon work, said Ballenger.

“The Air Force completely underestimated the benefit GPS has brought to modern warfare,” said Loverro. “There has been a revolution in the military and our abil-

ity to fight because of GPS. It provides not just unheard-of precision in navigation, but unheard-of precision in time that is unrivaled in human history,” he said. “Civilian industries have also come up with all sorts of ideas and innovations on how to use GPS,” said Ballenger. “Some of them are very important as well as creative.”

GPS is being used by scientists to study the ongoing deformation of the crust in Southern California caused by the San Andreas fault and other faults in the Los Angeles area. The Southern California Integrated GPS Network measures the millimeter-scale movements of the crust between earthquakes, and also records displacement of stations during earthquakes. GPS also measures the size of an earthquake by examining the final amount that a station has been displaced in an event.

GPS is also being used to track a herd of 1,500 elk in New Mexico providing information on the animals’ location and migratory habits. “We can get a location every day so we can take a look at daily movements,” said Sam Smallidge, Elk Movement project coordinator.

“GPS is tremendous,” said Ballenger. “The decisions we make here will affect the entire world in ways we can’t imagine,” said Loverro.

# GPS modernization efforts increase capability

**Peggy Hodge**  
Public Affairs

“The NAVSTAR Global Positioning System is currently undergoing dramatic changes to its architecture,” said Col. Douglas Loverro, Director, GPS Joint Program Office. “This program is known as GPS Modernization. These changes set the stage for the next generation of GPS called GPS III.”

Over the last several years, the Depart-

ment of Defense has been studying the need to improve GPS capabilities to meet the needs of the military—to protect friendly use and prevent adversary use of GPS. A new, more secure military signal with more power is needed to ensure military access to GPS under hostile conditions.

“To the military, modernization means more and better. We’ll be putting more signals out there—a new military signal just for military use. This signal will provide much more resistance to enemy ac-

tion and much higher accuracy. It will give the warfighter unimaginable ability to target enemy forces. We will be able to hit exactly where we want, every time we want,” said Loverro.

And to make GPS a more useful and robust system for national and international civil use, greater accuracy, availability and integrity is needed from the civil signal. To provide a more robust signal, a second civil signal will be added to the GPS signal architecture. In addition, a third civil GPS signal at a new frequency will be added

for use in safety-of-life applications such as aviation.

“To the civilian world, once again, GPS modernization means more and better signals than we have today—a much more robust signal called the L5 that will be used for navigation. In fact, within 20 years, any airplane you fly on will use this signal as its sole means of navigation precision and landing. We will not only be relying on GPS to get us from place to place, but airplanes will rely on it to land safely,” said Loverro.



# CSEL enhances survival of downed combat aircrews

**1st Lt. Tonya Summerall**  
Public Affairs

The Combat Survivor Evader Locator system, the next generation combat search and rescue communication system, was designed at the Space and Missile Systems Center’s development planning directorate and currently managed by the Global Positioning System joint program office here for the Department of Defense. The CSEL system will ensure combat personnel have a reliable and effective means of being quickly located, tracked, rescued and returned to friendly hands if and when the critical necessity arises.

The need for the superior capabilities of a CSEL system became graphically evident in the aftermath of the Serbian shoot-down of Air Force Capt. Scott O’Grady’s F-16 Falcon over Bosnia in 1996, said Lt. Col. Norm Albert, CSEL Global Positioning System joint program office program manager. O’Grady was stranded for six days following the shoot-down due in large part to the inadequacies of the communications and navigation equipment aircrews had available then.

The original need for an improved combat search and rescue capability grew out of deficiencies identified in Southeast Asia, and later during Desert Storm, where inaccurate situational awareness information contributed to loss of personnel and equipment.

CSEL is the first combat search and rescue system to incorporate a precise geolocation global positioning systems module, coupled with a multi-satellite, over-the-horizon communications capability tightly packaged in a 19 day, battery powered, hand-held unit weighing slightly less than two pounds.

The CSEL system, with a target cost of \$5,000 per hand-held radio, is scheduled for fielding in fiscal year 2002. Produced by The Boeing Company of Anaheim, Calif., the Pentagon intends to acquire more than 45,000 CSEL radios for the Air Force, Army and Navy aircrews to replace the old, Vietnam-era radios which have limited communications capabilities.

Originally envisioned in 1996 as an 18-month development program, the first group of CSEL radios underwent a series of preliminary operational assessments in

1998 at sites in Alaska, Washington and Arizona. During the initial testing, a significant number of technical deficiencies were identified. A Department of Defense Operational Test & Evaluation report found that the radio’s menu screen was too complex and slow to use in stressful combat environments, the two-way secure data communications over-the-horizon was unreliable, and the radio’s voice reception was garbled and noisy.

It was these early technical problems, coupled with several new requirements added to the program baseline without funding, which led the Air Force in 1998 to restructure the program using an evolutionary, spiral development approach. Focused on correcting the deficiencies from the first operational assessment, a second set of development field-tests were conducted at Hurlburt Field, Fla., in September 1999. The data gathered at Hurlburt Field showed that overall testing was successful and fixes were made to 10 of the 14 deficiencies identified during early tests, said Albert. Development of the radio is just months away from completion, with more operational testing planned over the next 18 months.

“Our spiral development approach is continuing to provide us a tremendous opportunity to get operator feedback and get the bugs out of the system well before the system is fielded.”

The Joint Requirements Oversight Council approved a revised CSEL Operational Requirements Document February 29. This new ORD adds interoperability key performance parameter for the program.

“It’s rare a program manager will tell you adding a key requirement four years into a development effort is a good thing, but in our case, it will take a significant amount of risk out of the initial operational test and evaluation, and the ability to field the system as soon as possible,” said Albert.

Basically, any technical challenges we’ll likely encounter in meeting our interoperability requirements in the next two years will not delay initial fielding of the system, said Albert. The other newsworthy item from this ORD is that it states the initial CSEL capability will also support coalition operational rescue forces. We have a lot of work to do to make this happen, but the coming year we’ll begin working the security policy issues to determine what capabilities within the system being procured

for US forces will be available to our allies. Existing survival radios are only effective if friendly forces are within line of sight communication and offer little to counter the possibility of intercept or jamming by the enemy. CSEL gives the warfighter the capability to communicate over-the-horizon directly with search and rescue forces around the globe.

The CSEL system architecture is composed of three segments. The user equipment segment consists of the multi-function, hand-held, software re-programmable radio incorporating the latest GPS anti-jam/anti-spoofing technology that enables the downed crewmember to transmit his or her precise location to rescue forces.

The satellite communication segment incorporates four worldwide ultra-high frequency base stations providing two-way secure messaging and location. The ground segment contains the Joint Search and Rescue Center software application that facilitates communications with the downed crewmember and interfaces with existing command and control systems.

“The two biggest development and integration challenges we have left in front of us are a new CSEL Joint Search and Rescue Center software application and a directed change in the way we will eventually have to communicate over the ultra high frequency communication satellites. Up until about a month ago when this ORD was approved, we were required to deliver these interoperability capabilities with our initial fielding of the system,” said Albert. “However, the program office was recently successful in demonstrating to the leadership in DoD, as well as the services and CINCs’ staffs, that the incremental capability we tested successfully last fall at Hurlburt Field could save lives.”

Combat search and rescue missions have historically experienced a low success rate in making rescues because existing survival radios can be easily monitored and located by the enemy. The CSEL system brings today’s commercial technologies to bear in resolving those deficiencies and greatly improving the chances of aircrew survival. With the new ORD and operational testing later this year, the CSEL program is on track and postured more than ever to field a critical combat search and rescue capability as soon as possible, said Albert.

## OSS&E: AF directive ensures program safety, suitability, effectiveness

**Capt. Jodi Unsinger**  
Public Affairs

New Air Force policy focusing on sustaining systems and end-products throughout their life cycles will require all system program offices to document and execute rigorous system engineering practices.

Air Force policy directive 63-12, “*Assurance of Operational Safety, Suitability and Effectiveness*,” is intended to preserve technical integrity through disciplined engineering practices, assurance of proper operations, maintenance and effective supply systems and feedback of utilization and maintenance trends.

“OSS&E assurance is critical for mission success,” said Les Bordelon, direc-

tor of SMC Systems Acquisition directorate. “OSS&E activities during product development will be key to suitable and effective operations and sustainment,” he said.

AFPD 63-12 arrives at the same time the Air Force is addressing recommendations from the Broad Area Review, which concluded that the Air Force needs to focus on engineering insight and product sustainment throughout the life cycle of launch vehicles.

The policy supports the development and preservation of OSS&E baselines, or descriptions of characteristics and limitations of any system/end-item that must be understood, acknowledged and maintained during operational deployment, use, experimentation, training and maintenance.

Program offices and operating com-

mands, including Air Force Space Command, will develop and coordinate baselines. Product centers will develop, deploy and maintain assurance criteria, processes and standards to support OSS&E of their product line

While OSS&E is required of all Air Force programs, differences in the nature of maintenance and sustainment of aircraft and spacecraft present SMC with some unique challenges in complying with higher headquarters guidance.

“Because a launch is such a big event, we’re probably focusing more on development issues than other product centers,” said Capt. Doug Cool, chief of the acquisition directorate’s systems integration branch.

Because of this, SMC’s systems acquisition directorate is spearheading SMC’s OSS&E policy in SMCI 63-1201,

which executes higher headquarters policies, addresses OSS&E’s key elements and defines the Center’s OSS&E processes and assurance plans.

“We’re providing center-level assurance processes, so we can support the program offices and verify that activities across the center properly implement rigorous system engineering processes,” said Cool.

The instruction will require SPOs to implement the key OSS&E elements, which include disciplined engineering processes, logistical details and certification.

The assurance process will consist of ongoing assurance assessments

# ABL takes lasers to new heights

**Ken Engledes**  
ABL Public Affairs

Destroying scud-like missiles such as those used in the Gulf War is a feat currently being developed by SMC's Airborne Laser program office located at Kirtland AFB, N.M.

Its mission is to develop a laser powerful enough to extend hundreds of miles away to destroy missiles that could be traveling two-thirds of a mile per second. Sophisticated sensors and optics must spot the missile shortly after launch and direct the laser, keeping it focused on its fast-moving target. Corrections must be made for the atmosphere, which typically distorts and spreads a laser beam.

"This 'speed-of-light' weapon will give our warfighters the ability to destroy theater ballistic missiles in their boost phase while over enemy territory," said Col. Michael W. Booen, director of the Airborne Laser System Program Office. "We're over 40 percent complete and still on cost and schedule. The individual technologies are proven and jet modifications are underway."

As one of the Air Force's highest priority programs, ABL involves a series of weapons class lasers aboard a modified Boeing 747-400 series freighter aircraft and uses those lasers to destroy theater ballistic missiles shortly after being launched. The aircraft is designated the YAL-1A Attack Laser.

Airborne Laser cleared a major hurdle in January when it took delivery on aircraft number 00-0001, a green Boeing 747-400 aircraft destined to be the anti-missile system's first flying platform.

The aircraft, fresh off the line at Boeing's Everett, Wash., plant, was flown to the Boeing facility at Wichita, Kan., where it will undergo 18 months of modification to bring it on board as the first of an envisioned fleet of seven ABL 747s. The most visible sign of the work will be the addition of a 14,000-pound nose turret, which will replace the conventional 747 nose cone. The turret, shaped like an elongated oval with eye-like windows, will house the laser firing mechanism.

Work also is underway by the other two contractor members of Team ABL—Lockheed Martin and TRW—on other components vital to the system's operation. Under the \$1.3 billion contract for the first phase of the plan – the Program Definition and Risk Reduction segment—the contractors have distinct responsibilities.



Courtesy illustration

**Artist's conception of a Boeing 747-400 aircraft carrying an active laser ranger designed to acquire, track, target and destroy missile targets with a high-energy laser beam.**

Boeing, in addition to building the aircraft, will manage systems integration and develop the computers and software necessary for communications, intelligence and laser operation. TRW Space and Electronics Group of Redondo Beach, Calif., will perfect the chemically operated laser itself, and Lockheed Martin Missiles and Space of Sunnyvale, Calif., will be in charge of developing the beam-and-fire control system.

Under the current plan, the first Air Force craft of the new millennium will fly to Edwards AFB in March 2002 where an operational battery of six lasers will be installed. The schedule calls for a series of live-fire tests to begin in 2003. However, this timeline likely will slip if Congress approves President Clinton's proposed budget calling for funding cuts of about \$900 million. If the President's plan is approved, it could delay the program for two years or more, said Booen.

However, Col. Booen remains optimistic that the funding cuts will not seriously damage the project's momentum. Although, he said it was difficult to immediately

quantify the seriousness of the situation.

"This probably will unravel in the next few months," Booen said soon after the details of President Clinton's proposed budget were revealed. "It will probably take us a good month to come to a place where we're comfortable between us and the contractor team, and then somewhere on the order of another month before we work our way through the Air Force and Office of the Secretary of Defense leadership, and then get to the staffers, so clearly in time for their budget marks cycle."

"In the meantime, while the other members of Team ABL are perfecting their components, we are focusing on the system Critical Design Review scheduled for late April," Booen said. "That's a week-long series of sessions where we put every component on the aircraft under a microscope to make sure each one meets the design specifications. We want to make sure we're ready when the date to begin testing rolls around."

## Air Base Group builds foundation for future success

**John Ryan**  
Public Affairs

A high-tech space systems development and engineering organization like SMC requires the assistance of hundreds of support people to be successful.

In the case of Los Angeles AFB, the 61st Air Base Group is that cutting-edge support entity. There are multiple infrastructure improvements in the works or on the drawing board.

Ground breaking for the new state-of-the-art medical clinic is scheduled for June with a completion date of 2002. This facility should help alleviate the crowded conditions now prevalent at our clinic with

TRICARE enrollment now over 6,500 and increasing with the closure of El Toro Marine Corps Base and Long Beach Naval Yard facilities. The new clinic, with its drive-up prescription window, will be a welcome addition to its clientele.

The new fitness center will be included in the 2001 military construction budget.

In addition, the Army Air Force Exchange Service is looking favorably toward approving construction of a new base exchange in fiscal year 2002.

However, the most prominent facility upgrade is the proposed systems acquisition management support complex. Since current facilities cannot be economically upgraded to meet current seismic codes, the base is obtaining the necessary approv-

als from the Pentagon and Congress to make this project a reality.

The key to SAMS hinges on an exchange of current Air Force land for an updated and consolidated work space, which will offset the large capital expense paid each year for existing facilities.

"Local Congressional representatives have endorsed this idea, and it is the intention of our senior leadership to improve and right-size Los Angeles AFB facilities, while providing environmentally responsible facilities to the community," said Lt. Col. Aaron Bridgewater, SAMS project officer.

The benefit of SAMS is far-reaching for both the Air Force and the local El Segundo community. First, it confirms our commitment to the local area and at

the same time, SAMS will reduce the maintenance cost being poured into our old facilities. Additionally, the construction process of these new facilities will generate economic benefits to the local community.

"The medical clinic, fitness center and the AAFES complex represent the first construction, other than housing work, approved and funded for Los Angeles AFB since 1983," said Col. Dave Price, 61st ABG commander. "These three projects along with SAMS will be a welcome addition to the base. The facilities will provide the professional and quality-of-life tools which enable the men and women of Los Angeles Air Force Base to deliver unrivaled space, missile and information systems to the joint warfighter and our nation."



# Space Based Laser: Making theory reality

**Cadet Col. Liz Aptekar**  
AFROTC Detachment 60, University  
of Southern California

Over the past two decades, the Defense Advanced Research Projects Agency, the Air Force and the Ballistic Missile Defense Organization, formerly the Strategic Defense Initiative Organization, have developed the technologies enabling a space-based laser system.

Los Angeles AFB, is the home of the Space-Based Laser Program, which has made significant progress toward advancing the technologies needed to build a space-based laser.

The mission of the SBL is national missile defense against inter-continental ballistic missiles with a secondary mission of Theater Missile Defense.

The latest efforts, led by the Air Force, are to further advance and integrate the technologies into a project called the SBL Integrated Flight Experiment.

The SBL IFX is a space-based experiment to gather data to determine the feasibility of deploying an operational space-based laser system in the future.

IFX is not planned to have any operational use other than for gathering information.

The SBL IFX is a sub-flight vehicle which will serve as a space testbed for the technologies. Most importantly, it

provides an opportunity to resolve integration challenges inherent in combining precision optics and high-energy lasers onto a lightweight spacecraft.

The IFX space vehicle is planned to have a launch date between 2010 and 2012 for a 3-year mission. The primary goals of IFX are to validate SBL as a viable option for missile defense while obtaining performance and operations data.

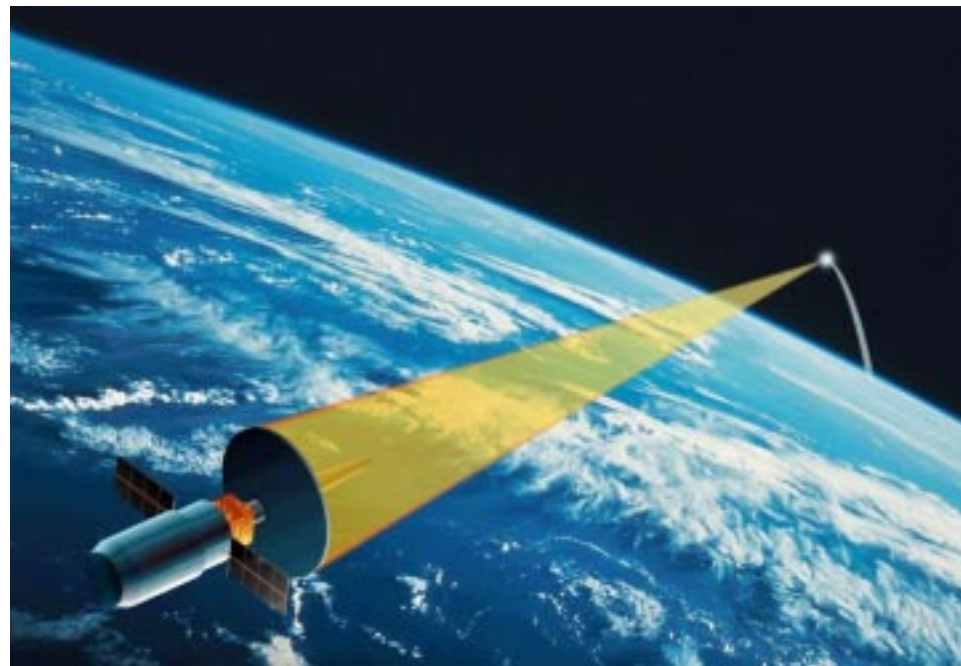
If IFX proves successful, it will demonstrate for the first time an important air and space force advanced capability: the ability to shoot a laser on target to a missile in its boost phase successfully and safely from space. Boost phase intercept prevents missiles from reaching the target.

The sooner the missile is destroyed, the greater the shortfall, an invaluable deterrent to using weapons of mass destruction.

Currently, the SBL IFX is in the early stages of development. The project is proceeding through a technology risk reduction phase which will last about two years. This will be followed by the construction of an integrated test unit ground demonstration, followed by the IFX spacecraft launch in fiscal year 2012.

IFX will provide decision makers with required data for future air and space superiority system deployment.

The SBL program boasts the first



Courtesy illustration

**The Integrated Flight Experiment is planned to launch FY12, demonstrating the capability of lethally intercepting a ballistic missile in its boost phase.**

innovative Joint Venture consisting of Boeing, Lockheed Martin and TRW. The corporate team, named Team SBL IFX is responsible for designing, developing and testing the SBL IFX.

The JV was formed to bring together national expertise on laser technology and system integration and to ensure there are viable competitors for a future operational system.

The Space-Based Laser Branch of the Advanced Systems Directorate has been responsible for the execution and management of the Space-Based Laser

project consisting of the SBL Integrated Flight Experiment and related technologies.

Recently, the SBL program was approved to become its own separate office reporting directly to the SMC Commander.

The new project office will have the designation of SMC/TL and is expected to stand up May 1.

This change reflects the increased importance placed on the project by the Air Force and the Department of Defense.

## OSS&E from Page 14

throughout the system life cycle documented in the assurance plan. Launch vehicles and selected satellite and ground systems will have an independent readiness review, a technically independent team assembled by the acquisitions directorate that will review the contractor's engineering performance.

The IRRs will be conducted to evaluate the technical impact of new developments or changes in a system baseline and support the SPO director and SMC commander in certifying space flight worthiness.

Impact of OSS&E may vary among program offices.

"It's going to depend on the rigor in their present engineering systems," said Cool. "If it's already rigorous, there may be no impact or drive to make it even better. If there isn't enough rigor, it'll drive them to fill the holes in."

Direct impact on the SPOs will be the developing and maintaining the assurance plan, provide SPO and contractor support to the IRRs and reporting metrics to the SMC and AFMC commanders.

Metrics will be defined by six levels, beginning with Level 1, assigning a chief engineer, to Level 6, being

fully compliant with OSS&E policy. For SMC, eight systems will report, including launch programs. These systems will have to report their level quarterly, said Cool.

At this time, the SMC instruction is in coordination with 2-letter officials. Once issues are resolved, the final draft will be sent to the SMC commander for approval. Program offices will begin submitting draft OSS&E assurance plans in May, which will be coordinated and forwarded for the SMC commander's approval.

So far, the policy has received significant support from several program directors, but they're also concerned with the additional resources the policy will require from them to support it.

"They emphasized the need to put good systems engineering rigor in there, but are concerned that they can adequately meet the requirements of OSS&E," said Cool.

"They want to make sure they're doing it, they're putting a lot of energy into it, but they're obviously concerned about the manpower and cost issues associated with it," he said.

The other concern addressed, said Cool, is having consistency across the program offices in terms of the rigor that's being implemented. "So when a program tells us they're OSS&E assured, it'll mean the

same thing from GPS as it does from MILSATCOM and so on."

The approach has also been well received by staff members. "SPOs have concerns about what's going on; that's why I'm offering to go out and talk to them," Cool said. "We're trying to minimize the negative impacts and maximize the positive impacts."

Cool adds that the acquisitions directorate's intent is not to be a hindrance.

"We're trying to help out," he said. "We're trying not to put out unnecessary reviews or policies, yet at the same time, make sure we've got rigor in our system engineering."

Bordelon briefed senior officials at a January corporate management review, and the SMC commander reiterated his support for making OSS&E happen.

"We're already doing much of what's in here," Cool said. The SMC commander is conducting the flight readiness review, appointing a mission director for SMC payload launches, and certifying space flight worthiness.

"The bottom line," said Cool, "is everyone needs to ask themselves, 'What can I do to help make sure that my system's safe, suitable and effective and stays that way?' This applies to everyone across the board."

Anyone interested in more information or a briefing on OSS&E can call Capt. Cool at 363-2374.

# Discoverer II touts improved surveillance

**John Ryan**  
Public Affairs

The Discoverer II Joint Program is an Air Force, Defense Advanced Research Projects Agency and National Reconnaissance Office cooperating initiative designed to improve military surveillance capabilities through the use of a future constellation of Space Based Radar satellites.

The joint program office, located in Arlington, Va., was established in February 1998 and designated Discoverer II two months later.

The goal of the Discoverer II program is to develop, design, fabricate and launch two research and development satellites in 2005 that will demonstrate the capability to detect and track moving targets on the earth's surface, produce high-resolution imagery, and collect precision ground mapping data.

During the fiscal year 2000 appropriations process and fiscal year 2001 budget cycle, the program was under scrutiny from decision-makers who questioned the affordability of the demonstration.

Last November, an independent cost team from the NRO and Air Force concluded the demonstration program's cost was consistent with the funding com-

mitment of the three partners.

"The Discoverer II program is alive and well," said Lt. Col. Allan Netzer, Discoverer II Program Manager. "During the past year or so, we have had some significant technological successes and demonstrated that Discoverer II is affordable."

The Discoverer II program is tied closely to an operational space based radar concept for a follow-on constellation envisioned for 2010.

Colonel James Puhek, the Discoverer II System Program director, has visited six of the warfighting commands this year describing the DII program.

"We are visiting the warfighters, briefing them on the utility that a follow-on operational system to the DII demonstration could have for them," said Puhek. "We've had very enthusiastic responses at the Deputy CINC level for the program."

In February 1999, contracts were awarded for the first phase of the program. This first phase involves concept exploration, preliminary design and risk reduction work.

The second phase, planned for early fiscal year 2001, will complete design, fabrication, integration, testing and operation of two demonstration satellites scheduled for launch in fiscal year 2005.

## EELV critical to space access

Developing and acquiring future spacelift vehicles is what the 125 employees of the Evolved Expendable Launch Vehicle program office are tasked with every day.

Known as EELV, the program will modernize and improve the nation's access to space by making space launch more reliable and affordable.

An Air Force initiative, the program is designed to reduce the cost of launch by at least 25 percent over the current Delta, Atlas and Titan launch vehicles. This will save taxpayers more than \$6 billion in launch costs between 2002 and 2020.

EELV will replace the existing fleet of launch systems with two families of launch vehicles using common components. Improvements over current systems will include a standard payload interface, standardized launch pads and off-pad processing.

The program is currently in the engineering, manufacturing and development phase, which runs through fiscal year 2002. During this phase, the contractors will complete engineering and manufacturing development of the launch vehicle system, launch pads, satellite interfaces and support equipment. Contractors will also demonstrate that the system meets all government requirements via two system launches. Two launch services contracts covering 28 missions are also in place through fiscal year 2006.

Launch vehicles to be used in this program are the Boeing Delta IV and Lockheed Martin's Atlas V. *(Information provided by SMC Public Affairs.)*

# Mission success thrusts Launch Programs into new era of space lift

**1st Lt. Tonya Summerall**  
Public Affairs

Space and Missile Systems Center's Launch Programs Office provides critical support to the warfighters and national decision-makers by delivering the nation's highest priority spacecraft to final mission orbits via heavy-space and medium-lift space vehicle systems.

Colonel Mike Dunn, System Program Director, and his launch programs team, manage development, acquisition, and operational launch and support of the Atlas II and III, Delta II, Titan II and Titan IVB space boosters, as well as the Centaur and inertial upper stage boosters. These programs have a direct influence on the success of \$20 billion worth of critical space assets for a variety of customers. With 40 remaining launches to go amidst significant Air Force personnel cutbacks, the PERSTEMPO and OPSTEMPO are at an all-time high for launch programs.

Unfortunately, the last year and a half were beset by a number of booster failures, both military and commercial. "It's been a very difficult time for the space business in general and especially for the people who build and launch rockets" said Dunn. "However, my focus and the focus of my entire team is sharply on mission success as the number one priority. Since the first Titan failure in August of

1998, we have been on a full court press to identify and correct the causes of these mishaps."

Prior to the Presidentially-commissioned Space Lift Broad Area Review, the Air Force and industry teams provided the bulk of engineering talent which directly supported 11 different safety investigation boards, accident investigation boards, engineering analysis teams and contractor-sponsored boards. The teams put over 100 action items in work, including both formal corrective actions from the investigations as well as additional program initiatives which provided a sound foundation for the BAR to build on, and helped them to understand the specific root causes that led to the failures. The BAR took a fresh look at all aspects of military space launch and provided their executive level perspectives, unique insights and additional recommendations.

Among the most significant corrective actions is implementation of the new Flight Readiness Review process, in which Launch Programs has routine meetings with the center commander at least monthly to review launch vehicle fleet-wide quality concerns, key manufacturing and launch process issues, and a number of related items. This new process culminates in a formal flight readiness review, chaired by the SMC commander, which is normally scheduled between a week to 10 days prior to launch. At that

review, SMC certifies the flight worthiness/readiness of the launch vehicle and provides a forum to assess the rest of the "stack." SMC also implemented an initiative from the Air Force Chief of Staff on Operational Safety, Suitability, and Effectiveness to help improve systems engineering rigor in the mission assurance process.

Other key efforts involved working closely with Air Force Space Command to refine launch site roles and responsibilities in response to BAR recommendations, and to develop a new launch schedule and funding profile out to fiscal year 2003. A key result was to designate an SMC Mission Director for all Air Force missions, beginning with Titan IV B-29, the upcoming Defense Support Program mission. Also, the contractor took the initiative to institute a "clean vehicle" ship policy to improve processing once the vehicle arrived at the launch site. In addition, the Launch Programs' detachments are leading a Joint Surveillance Plan to enhance launch processing, communications, and visibility of issues at the launch site. When problems are encountered, Launch Programs has made it clear they will slow down or postpone the timeline to ensure the focus remains squarely on mission success.

Launch Programs has an outstanding team committed to mission success. They rely on the technical expertise of The Aerospace Corporation's Space Launch Operations Directorate, selected as the Launch



Courtesy photo

**A titan is set for an early-morning launch at Cape Canaveral AFS, Fla.**

Programs' "Team of the Year" for 1999. Even though manning levels are at an all-time low, Launch Programs is taking proactive efforts to improve the focus on quality and mission success.

"We've initiated the 'Test Like You Fly' philosophy, and I am pleased to say with conviction that Launch Programs has really come a long, long way over the last 18 months," said Col Dunn. "However, we remain vigilant because we still have many challenges ahead of us to ensure mission success."



# MILSATCOM ensures critical communications capability to warfighter

**Hap Parker**  
Public Affairs

The Military Satellite Communications joint program office manages five major communications satellite systems and capabilities, including ground terminal operations. Three satellites are currently on orbit and the other two are next generation follow-on systems.

"It is our job to research, develop and purchase military space systems to provide responsive, high-priority communications satellites that allow defense officials and battlefield commanders to exchange crucial information during war," said Brig. Gen. Craig Cooning, MILSATCOM JPO director.

"To be effective at what we do, it is important to have the proper mix of technical experts and support people who daily work hand-in-glove with each other to accomplish our mission. Everyone on our team is important."

The general went on to say that his MILSATCOM JPO manages four ACAT 1D defense programs, those programs which receive the highest defense acquisition priority.

"The truth of the matter is," said Cooning, "you probably can hear more communications trend 'buzz' words in our program office than in others. Some of our activities parallel exactly what's going on in the commercial communications arena."

## MILSTAR

Milstar is the Defense Department's most technologically advanced telecommunications system. Originally designed to satisfy the nation's strategic requirements, it now also provides powerful tactical capabilities.

The \$9.2 billion Milstar system consists of a constellation of five secure, highly jam-resistant satellites and a multifaceted ground control system. Today, only two Milstar satellites are operating on orbit. "We expect the other three satellites to be launched in the next few years to provide additional direct communications support to mobile forces across the globe," said Lt. Col. (colonel selectee) Toni Arnold, Milstar program manager.

"Defense users of Milstar are quite familiar with the phenomenal successes we had during the Gulf War and the recent events in Kosovo," said Arnold. "There was heavy reliance on our satellites to provide battlefield commanders with almost instantaneous data and information needed to prosecute those wars successfully."

Milstar's "switchboard-in-the-sky" operational concept is considered revolutionary because the satellites handle all processing and traffic management chores without ground station relays, greatly en-



Artist's conception of a Milstar, one of the five MILSATCOM programs, on orbit. Courtesy illustration

hancing data security and jam resistance.

"Right now," Arnold said, "the Milstar Team is putting the finishing touches on the second Milstar Block II spacecraft, Flight four, which will ensure robust command and control for regional military deployments. Combining low and medium data rate capabilities will bring a major improvement in Milstar's utility during regional peacekeeping or combat missions. Flight 4 is expected to be operational in early 2001," she said.

## DSCS

"The Defense Satellite Communications System, DSCS – or 'discus' as we pronounce it, is our space and terminal network system providing super high-frequency, anti-jam, secure voice and high-data rate communications to air, sea and ground users," said Lt. Col. Terry Peterson, director of the DSCS space segment.

"In addition to basic communications, we use this system to transmit space operations and early warning data to other systems and users. We just launched a DSCS III in January, a modified version with increased tactical capability, and we plan to launch another one in October of this year," Peterson said.

## GBS

The Global Broadcast Service is a relatively new communications system. It was born out of the Gulf War, which identified a need to provide worldwide, high volume throughput of broadcast military information, including maps and intelligence data.

"GBS is the answer to meet this need," said Lt. Col. (colonel selectee) Al Moseley, GBS joint program manager. "We phased in this capability and deployed our payload on three Navy UHF follow-on communications satellites representing the GBS Space Segment."

The GBS payload, consisting of four transponders per satellite, provides global coverage through three area spot beams up to 2,000 nautical miles wide. A \$1 billion program, GBS is a wideband voice, data, imagery and direct broadcast communications capability that provides one-way, high-speed data transfer up to 48 megabits per second to garrisoned, deployed or warfighting forces on the move.

"Our commanders in the field need massive amounts of information and data on demand. We make that capability available by broadcasting information from our uplink sites in Hawaii and Virginia. Italy will soon be on line. We provide the encrypted broadcast information needed to meet those demands by down linking that information from the UFO satellites into PC-based equipment called Receive Suites," Moseley said.

"The wider the band, the more information we can put through it quickly. That's what makes GBS so powerful. We can transmit information and data up to 1,000 times faster and in greater volumes than current communications systems," he said.

## ADVANCED EHF

Cooning pointed out that as Milstar and DSCS satellites age and newer technologies are developed, the need to continue state-of-the-art support to the warfighter remains. This will require developing and launching follow-on satellites to take their places.

Chief among these initiatives is the Advanced Extremely High Frequency system to provide communications connectivity across the spectrum of mission areas. This includes land, air and naval warfare, strategic defense and operations that improve on Milstar capabilities.

The Advanced EHF is the next generation space system designed to provide

worldwide, secure and survivable satellite communications to strategic and tactical forces. The first launch of this \$3.5 billion, five-satellite system to replace Milstar is scheduled for mid 2006.

According to Navy Commander Bill Rozwod, chief engineer for AEHF, this future system will afford U.S. and allied ground, maritime and airborne forces with joint interoperable tactical and strategic communications.

"This future system will provide worldwide survivable, protected service beyond Milstar with significantly more capacity to support the emerging communications needs of the 21st century warfighter," Rozwod said.

Rozwod added that the AEHF system offers a level of protection against both jamming threats and nuclear effects available from no other system. "It will become the core wide-area communications system our joint forces can rely upon through all levels of conflict."

## GAPFILLER

Another important MILSATCOM program is the Wideband Gapfiller Satellites. When fielded, this three-satellite constellation will augment current DSCS and GBS assets. Together, this "system of systems" will provide critical communications capability to the warfighter. The first launch of this \$1.1 billion program is scheduled for late 2003.

Why do we need this additional wideband communication capability?

The art of war has changed significantly from the days when courier pigeons or field telephones were used to carry information to field commanders.

"Today's military, which employs precision engagement and demands full dimensional protection, requires massive amounts of real-time information. Gapfiller, an interim, commercial-like communications satellite system, will allow us to provide five times the capability as one 1980's vintage DSCS," said Lt. Col. Brian Magazu, Gapfiller program manager.

Magazu said Gapfiller is the first application of commercial acquisition guidelines to a satellite purchase.

"Our job is to fill the communications 'gap' between today's user demand and the projected demand in the 2010 era, when the next generation Advanced Wideband System will be fully deployed. In the meantime," he said, "our goal is to provide maximum bandwidth to the battlefield."

Magazu added, "Gapfiller, as with all SMC programs, would not be successful without the full partnering of our Aerospace Corporation teammates and industry. It is the triad of government, aerospace and industry people who provide the teamwork needed to meet Air Force, DoD and national communications needs."

# Services forges ‘quality of life’ upgrades

**Carlen Capenos**  
Services Division

The future should be exciting for Services at Los Angeles AFB. In the works are projects – both big and small – our customers have requested. The following is a synopsis of what to look for in the near future.

**The Club**

Preferred Plus is a program coming to Los Angeles AFB May 1. It is a new way to save at Services. You’ll save 10 percent on selected purchases at most Services facilities as well as gain access to The Club. It’s as simple as showing your Services club card at the time of purchase. You do not have to charge the purchase on your card to receive the discount, just simply show it. *Enrollment is automatic for current club members.* They can begin enjoying the benefits of this program May 1. For more details, call The Club at 363-2230.

**Fitness Center**

If you thought we were finished with a new basketball floor or the cardio theater, you’d be wrong. If you thought we were done when the heating and cooling system was finished, you’d still be wrong. We have an entire new center in the design stage. The

final design should be complete this year, and if everything goes on schedule, the project should be funded in 2001 and ground-breaking should occur by the end of the 2001. The new center includes a lap pool, racquetball courts, state-of-the-art locker rooms with saunas and whirlpools, a basketball court, aerobics room, free weight room, and, of course, we will be taking our new cardio theater over. For more details, call the fitness center at 363-6815.

**Fort Mac Child Development Center**

Fort Mac CDC will be adding infant slots this summer. Rooms will be reconfigured to accommodate the 6 week to 12 month age group. For details, call the Fort MacArthur CDC at 363-8335.

**Youth Center**

The youth center is in line for more renovation and expansion in building 425 at Fort Mac. Stage 2 is adding a new kitchen, administrative offices, and teen center by the end of the year. The entire bottom floor of building 425, with the exception of the Shoppette, will serve the youth at Los Angeles AFB. For details, call Iris Alexander, Family Member Flight Chief at 363-5950.

**Outdoor Recreation**

The Outdoor Rec program will be moving to building 242 next to the fitness center this spring. Once there, several new programs will be added. A golf

simulator and putting green will be installed, along with a pro shop and golf lessons. A bike tune-up shop will be included in the new building. Adventure programs are being planned for hiking, biking, rafting, kayaking and sailing. They will be looking for customer input on what type of programs they would like to see. So, if you have a preference please call. Outdoor Recreation is also expanding the Recreational Vehicle Storage Lot at Lawndale while closing the lots in El Segundo. Additionally, they will be open longer during the week and on Saturdays. For more details, call Outdoor Recreation at 363-2190.

**Lodging**

Fort Mac Inn will be installing a new reservation system called the “Touch” system this summer. This system will allow lodging to make reservations faster and more accurately. It is similar to systems used by major U.S. hotels. This system will be tied into SATO at a later date.

In Services, we are here to serve Los Angeles AFB. We strive to make our programs the best we can and aim to meet our customers needs. Please tell us how we are doing. Each facility has a customer comment box. Fill our customer comment box with suggestions, areas we can improve or things we are doing right. If you leave your name and a way to contact you, the manager will get in touch with you with a response.



# CW essential to space ops success

**Maj. Mary MacLeod**  
Public Affairs

Space and Missile Systems Center satellite and launch control systems program office provides the essential elements of infrastructure that support the Department of Defense satellite programs.

CW does this through a \$400 million program with 278 people, 100 of which are at SMC. The other 178 people are spread out across the nation at Peterson and Schriever AFB, Colo.; Vandenberg AFB and Onizuka AFB, Calif.; and Patrick AFB, Fla.

CW's mission is centered around two infrastructures: the Spacelift Range System and the Air Force Satellite Control Network. Both are vital to the health and status of our satellites. No rocket could be launched nor any satellite remain in orbit without their behind-the-scenes support.

"We have development and sustainment responsibilities for those two infrastructures," said Col. Barry Morgan, director of the Satellite and Launch Control office, "and they represent facilities around the world worth \$10 billion.

"We have to keep them running. We have to modernize them as the operations concept changes, as the booster program or satellite programs change their direction, and we have to make sure they're capable of supporting the Space Command mission 24 hours a day," said Morgan.

## Spacelift Range System—A range of activities

The spacelift range system performs its mission from two primary locations: Vandenberg known as the western range and Cape Canaveral called the eastern range.

During the launch of a satellite, the tracking systems, control and display functions and the telemetry hardware that relay data from the boosters to the ground systems come alive to protect public safety and to relay flight data to launch control centers.

"We provide the systems that are responsible for public safety," said Morgan. "The range weather assets, for example, look at weather patterns prior to a launch to determine how they might affect the launch itself and also how they might affect the exhaust gases and whether they would blow over populated areas."

The range also maintains the command destruct antennas able to destroy

the boosters if, at any point, the rockets become a threat to public safety.

"The launch wings can issue a command destruct order at any time," Morgan said. The 45th Space Wing at Cape Canaveral and the 30th Space Wing at Vandenberg can issue the order for destruction depending on their perception of the threat to public safety. Either wing can also "safe" the booster once the payload is on orbit.

Range involvement begins anywhere from a few days to several months in advance of a launch.

"There's a series of four or five activities that go on for each launch," Morgan said. "Basically, it's like a dress rehearsal."

These preparation activities occur in advance of the countdown to make sure the instruments are running, the launch crews are familiar with them and the data's getting to where it needs to ultimately go.

This series of checks guarantees that when the countdown starts, everything is working properly, Morgan added.

There are three segments that make the range function: the instrument, control and display and network segments.

The instrument segment consists of radars, optical systems, telescopes, mirrors, and all the weather instruments that support the go/no go launch decision.

The control and display segment takes all of that data in and creates the information displays for the launch decision-makers.

The network carries all of that data from the instruments to the decision-makers.

A lot of effort is going into improving and modernizing range infrastructure, especially at Cape Canaveral where the systems are 40 to 50 years old and have become more difficult to keep running.

"The initial modernization program under phase 1 of the Range Standardization and Automation program 1 (RSA 1) is just completing, and we've delivered a variety of new systems to the range. They're undergoing testing now," Morgan said.

RSA 2 is underway having already delivered one system that automates the scheduling of all launch operations. In other words, when 35 launches per year equate to approximately 175 activities, automation can be the key to a more efficient and effective operation.

## Air Force Satellite Control Network—Talking to the stars



Courtesy photo

**Air Force satellite control network at Onizuka Air Force Station, Calif.**

Once the satellite reaches orbit, the AFSCN takes over. The network performs many functions to ensure the satellite is operational and remains operational throughout its mission life. Again, the AFSCN infrastructure provides the systems and equipment necessary to make the satellite work but not necessarily to help it conduct its mission.

"Basically, we provide the systems that are used to monitor the health and status of the satellite, but we can also issue commands to it if it's not properly functioning. We act as kind of a telephone line to a satellite," said Morgan.

AFSCN is a network of ground systems which supports the nation's surveillance, navigation, communications and weather satellite operations. It provides the earth-to-space connection required to fly the satellites for DoD users. The satellite control network is active during the launch and early orbit phase and continues with the satellite's transition into final orbit.

There are three segments that make up the "telephone line" from earth to the satellite.

Ground operators who do the "talking" to the satellites are located at two operational control centers located at Onizuka AFS and Schriever AFB for the command and control segment. They send their commands to commercial and DoD satellites or through commercial ground circuits in the communications segment. Then those commands are relayed to remote tracking stations at eight locations worldwide, ranging from Hawaii and Greenland to England and Guam, which forward them to the satellites.

AFSCN makes over 150,000 satellite contacts a year. Contact success rate is above 99 percent.

"Day to day, the AFSCN is in a continuous operational mode supporting launches and satellites that are in orbit to-

day. It's a constant mission," said Col. Randy Odle, CW deputy director and AFSCN program manager.

The AFSCN is looking forward to serious modernization of its capabilities. "The aim is to drive toward increased infusion of commercial-based products and services and improved interoperability with civil and commercial networks, such that AFSCN infrastructure and manpower requirements may be reduced," Odle pointed out.

By 2003, key Defense Information Switched Network communications systems upgrades for the AFSCN will be complete. This will replace the current AFSCN operational traffic switching system and will result in a more direct line of communication between the ground users and the satellite.

The vision for the AFSCN is to migrate toward an internet type of environment. If the network can succeed in defining standard interfaces, then it would be able to connect military systems with commercial systems and become the internet for the world of satellites.

It would be a more efficient and effective capability to reach out and touch not just civil or commercial or military tracking stations, but to use any combination thereof for a fully interoperable system, said Odle.

"We hope those improvements will yield better AFSCN operational capability, which mean less manpower needs and increased systems efficiency and effectiveness," said Odle.

"We're looking at a future that has more automation, less infrastructure but more capable systems," said Morgan. "The sky's no longer the limit."